

AMENDMENTS TO THE SPECIFICATION (as Amended During International Preliminary Examination):

On page 1, immediately following the title please insert a heading as follows:

BACKGROUND OF THE INVENTION

The heading beginning on page 1, line 4 has been changed as follows:

~~Description~~ Field of the Invention

On page 1, after line 11 please insert a heading as follows:

Description of Related Technology

The paragraph beginning on page 2, line 1 has been changed as follows:

Moreover, ~~German Preliminary Published Application~~ DE 100 52 914 A1 describes a semiconductor device that is made up of a layer structure consisting of an electrically conductive support layer, an insulating layer, semiconductor particles and an electrically conductive cover layer, whereby the semiconductor particles are incorporated into the insulating layer and they touch the support layer that is underneath it as well as the cover layer that is above it. The semiconductor particles can consist, for example, of silicon or I-III-VI semiconductor particles that are coated with II-VI compounds.

The paragraph beginning on page 2, line 16 has been changed as follows:

It is also a known procedure to configure independent spherical semiconductor elements that constitute complete semiconductors, including the requisite electrodes. For example, ~~European patent application~~ EP 0 940 860 A1 describes using a spherical core to make a spherical semiconductor element by means of masking, etching steps and the

application of various material layers. Such semiconductor elements can be used as solar cells if the p-n junction is selected in such a way that it can convert incident light into energy. If the p-n junction is configured in such a way that it can convert an applied voltage into light, then the semiconductor element can be employed as a light-emitting element.

On page 3, after line 7 please insert new paragraphs and a heading as follows:

Moreover, U.S. Pat. No. 5,578,503 discloses a method for the rapid production of chalcopyrite semiconductor layers on a substrate in which individual layers of the elements copper, indium or gallium and sulfur or selenium are applied onto a substrate in elemental form or as a binary interelemental compound. The substrate with the layer structure is then quickly heated up and kept at a temperature of $\geq 350^{\circ}\text{C}$ [$\geq 662^{\circ}\text{F}$] for between 10 seconds and one hour.

Moreover, U.S. Pat. No. 4,173,494 describes a semiconductor system with spherical semiconductors that are incorporated into a glass layer. The spherical elements protrude from the surface of the layer on both sides of the glass layer, whereby on one side, a metal layer is applied that joins all of the elements to each other. The spherical elements have a surface consisting of one conductor type and a core of the opposite conductor type. Thus, some elements have a core made of a material of the p-type, whereas other elements have a core made of a material of the n-type, resulting in p-n spheres and n-p spheres. Such semiconductor systems are especially well-suited for use in solar cells.

GENERAL DESCRIPTION OF THE INVENTION

The paragraphs beginning on page 3, line 8 have been changed as follows:

The ~~objective of the invention is to provide~~ provides a semiconductor element having a high activity that is suitable for flexible use in various solar cells.

~~The objective of the invention is also to provide~~ provides an efficient method for the production of a semiconductor element for use in solar cells.

~~Another objective of the~~ The invention is to provide also provides a method for incorporating a semiconductor element into a solar cell.

~~It is likewise the objective of the~~ The invention to provide further provides a solar cell having integrated semiconductor elements and a photovoltaic module having at least one solar cell.

Please delete the paragraph beginning on page 3, line 17.

The paragraph beginning on page 3, line 20 has been changed as follows:

~~According to the~~ The invention, the objective is achieved by provides a spherical or grain-shaped semiconductor element for use in a solar cell. The method for ~~the production of~~ providing such a semiconductor element ~~is characterized by~~ includes the application of a conductive back contact layer onto a spherical or grain-shaped substrate core, ~~by the~~ application of a first precursor layer made of copper or copper gallium, ~~by the~~ application of a second precursor layer made of indium and by the reaction of the precursor layers with sulfur and/or selenium to form a I-III-VI compound semiconductor.

The paragraph beginning on page 4, line 19 has been changed as follows:

In an especially preferred embodiment of the invention, the substrate core that is to be coated ~~consists of~~ contains glass, especially soda-lime glass, since this is a good source of sodium for the layer structuring. The main constituent of the conductive back contact layer is preferably molybdenum. In an especially preferred embodiment of the invention, the back contact layer contains up to 20% by weight of gallium in order to improve the adhesion. The

individual layers can each be applied by means of physical vapor deposition (PVD) methods such as sputtering or evaporation coating or else by means of chemical vapor deposition (CVD) methods.

The paragraph beginning on page 8, line 17 has been changed as follows:

In an especially preferred embodiment of the invention, the support layer ~~consists of~~ includes an insulating material such as, for example, a polymer. The spherical semiconductor elements were preferably produced by means of the method according to the invention and the front contact layer consists, for example, of a transparent conductive oxide (TCO). The back contact layer ~~consists of~~ includes a conductive material such as a metal, a TCO or a polymer having conductive particles. The solar cell can have other function layers in addition to the front contact layer and the back contact layer.

On page 9, after line 7 please insert a heading as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

The paragraph beginning on page 9, line 8 has been changed as follows:

Further advantages, special features and advantageous embodiments of the invention can be ~~gleaned~~ indicated from the subordinate claims and from the presentation below following description of preferred embodiments making reference to the figures.

The paragraphs beginning on page 9, line 12 have been changed as follows:

Figure 1 shows in illustration (a), an especially preferred embodiment of a layer structure for the production of a spherical semiconductor element and in illustration (b), a semiconductor element produced by means of the method according to the invention; and

Figure 2 shows in illustrations (a) to (d), the process steps according to the invention during the incorporation of a spherical semiconductor element into a solar cell.

On page 9, after line 18 please insert a heading as follows:

DETAILED DESCRIPTION

The paragraph beginning on page 9, line 19 has been changed as follows:

Figure 1, illustration (a), shows an especially preferred embodiment of a layer structure 10 for the production of a spherical or grain-shaped semiconductor element 11. The layer structure 10 can also be seen as the precursor layer structure for the later reaction to form a I-III-VI compound semiconductor. In the first step of the method according to the invention for the production of a spherical semiconductor element 11, a spherical substrate core 20 is coated with a back contact 30. The spherical substrate preferably ~~consists of~~ is formed glass, but it can also be made of other materials such as metals or ceramics. When glass is employed, for example, soda-lime glass can be used, which is a good source of sodium for the later layer structuring. Other glass compositions can also be used.

The paragraph beginning on page 10, line 14 has been changed as follows:

The semiconductor core 20 can be coated by ~~means of~~ PVD methods such as sputtering or evaporation coating. CVD methods can also be used; in this context, it must be pointed out that sputtering a large number of small substrate spheres is a very time-consuming process that, in view of the attainable throughput rate, is less suitable than other methods. The thickness of the back contact layer is in the order of magnitude of 0.1 μm to 1 μm .